


Waves		Superposition of waves
Learning objectives	MUST (C)	Explain how two waves combine in superposition
	SHOULD (B)	Define constructive and destructive interference
	COULD (A/A*)	Construct a diagram to show wave interference
<p>STARTER: Blow a bubble; catch it on the wand. Look at it patiently. What happens before it pops? What colours are there?</p> <p>EXTENSION: Can you explain this in terms of waves?</p> 		

Waves

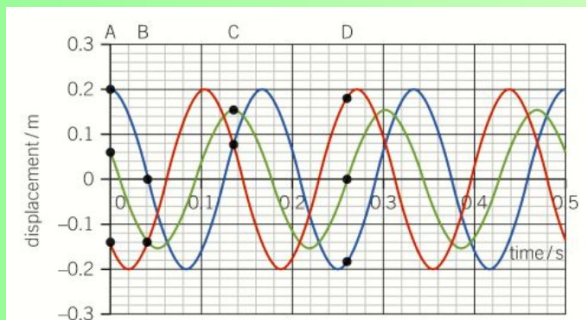
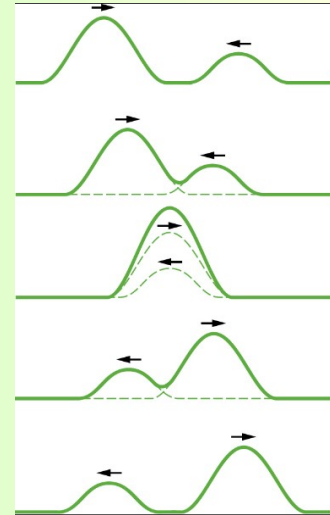
Superposition of waves

MUST (C)

Explain how two waves combine in superposition

Waves are a series of displacements from an equilibrium point. Displacements are vectors, with magnitude and direction; they can be added together to produce a resultant displacement.

What will happen to the waves on the right as they move towards each other? What will the resultant displacements be as they meet and then pass each other?



Which of these waves is the resultant? How do you know? Explain the resultant displacements at times A, B, C and D.

Extension: How does the amplitude of the resultant compare to that of the original waves? Why? Will this always be the case?

Waves

Superposition of waves

SHOULD (B)

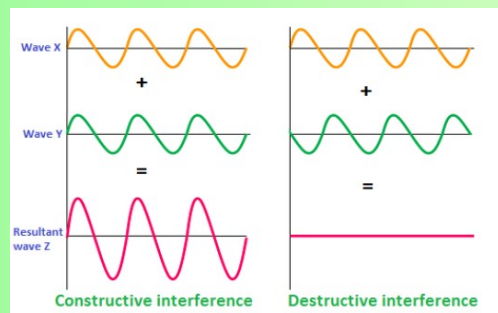
Define constructive and destructive interference

In our last example, we saw that the resultant wave had a lower amplitude than either of the two waves. Why?

They are out of phase, and near to antiphase (for most of the time, one wave is negative displacement and the other is positive).

What would maximise the amplitude of the superimposed wave?

What would minimise the amplitude of the superimposed wave?



Waves

Superposition of waves

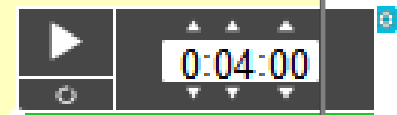
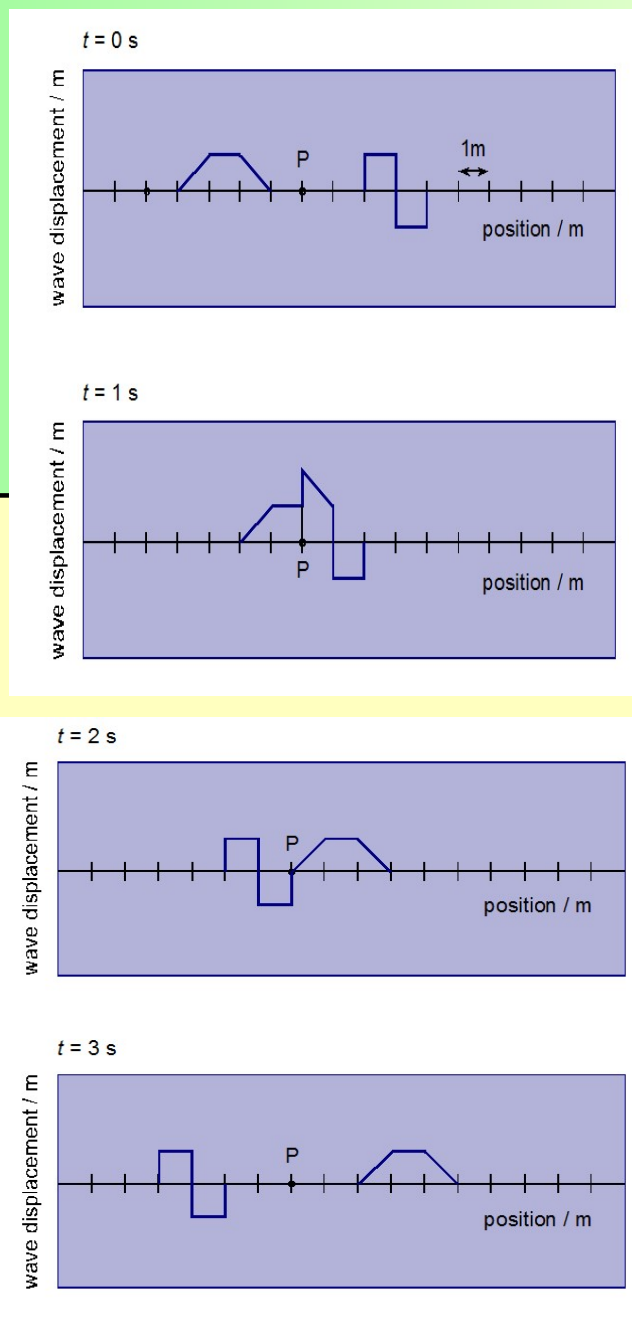
COULD (A/A*)

Construct a diagram to show wave interference

Task 1: complete the worksheet.

Task 2: apply your knowledge to the PPQ.

Task 3, extension: in the question paper, the minimum intensity, at point P, is $4 \times 10^{-6} \text{ Wm}^{-2}$. What is the maximum intensity, at O?



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PLENARY: Now apply what we know to the bubbles. Where could the interference be happening? What are the surfaces in bubbles?

